

## **SECTION 2 RIVER MANAGEMENT ALTERNATIVES**

Four river management alternatives (the Alternatives) are under consideration within the DEIS. The USIBWC will select an alternative for implementation after public comments on the DEIS. Because no preferred alternative has been selected by the USIBWC, each alternative is described in this section and an effects determination for each is presented in Section 6.

### **2.1 COMPOSITION OF RIVER MANAGEMENT ALTERNATIVES**

The Alternatives are composed of mission activities and environmental measures. Mission activities include ongoing O&M practices as well as future actions such as levee rehabilitation.

Mission activities and environmental measures for each alternative are described based on four management categories:

- Levee system management
- Floodway management
- Maintenance of pilot channel and irrigation facilities
- Sediment management

Mission activities and environmental measures are also described based on their respective location with the RGCP. The RGCP was subdivided into seven distinct geographic reaches identified as river management units. Each RMU presents unique opportunities and limitations for floodway management and implementation of environmental measures. Appendix B provides a description of each RMU and Figure 2-1 shows the location of RMUs.

Implementation of environmental measures results in either linear or point projects. Linear projects extend over several miles while point projects were limited to site-specific locations.

### **2.2 THE NO ACTION ALTERNATIVE**

The No Action Alternative consists of continuing O&M activities currently conducted by the USIBWC. Those activities are directed toward flood protection and water delivery, with some activities involving environmental improvements. The No Action Alternative is “no change” from current management direction or level of management intensity.

Maintenance activities are accomplished to ensure that the flood control and water delivery objectives of the RGCP can be met. The two primary locations where O&M activities are carried out are El Paso, Texas and Las Cruces, New Mexico. The USIBWC regularly patrols the RGCP from these locations and conducts inspections prior to the flood

and irrigation season of early March through September. Engineering surveys are performed regularly to identify potential problem areas due to sediment accumulation. The channel is inspected for bank sloughing, washing, or erosion during and after all flood events. Corrective actions are taken if problems are identified.

Key features of the No Action Alternative are:

- Levee system management.
- Floodway management through mowing and grazing leases.
- Maintenance of pilot channel and irrigation facilities.
- Sediment management.

### **2.2.1 Levee System Management**

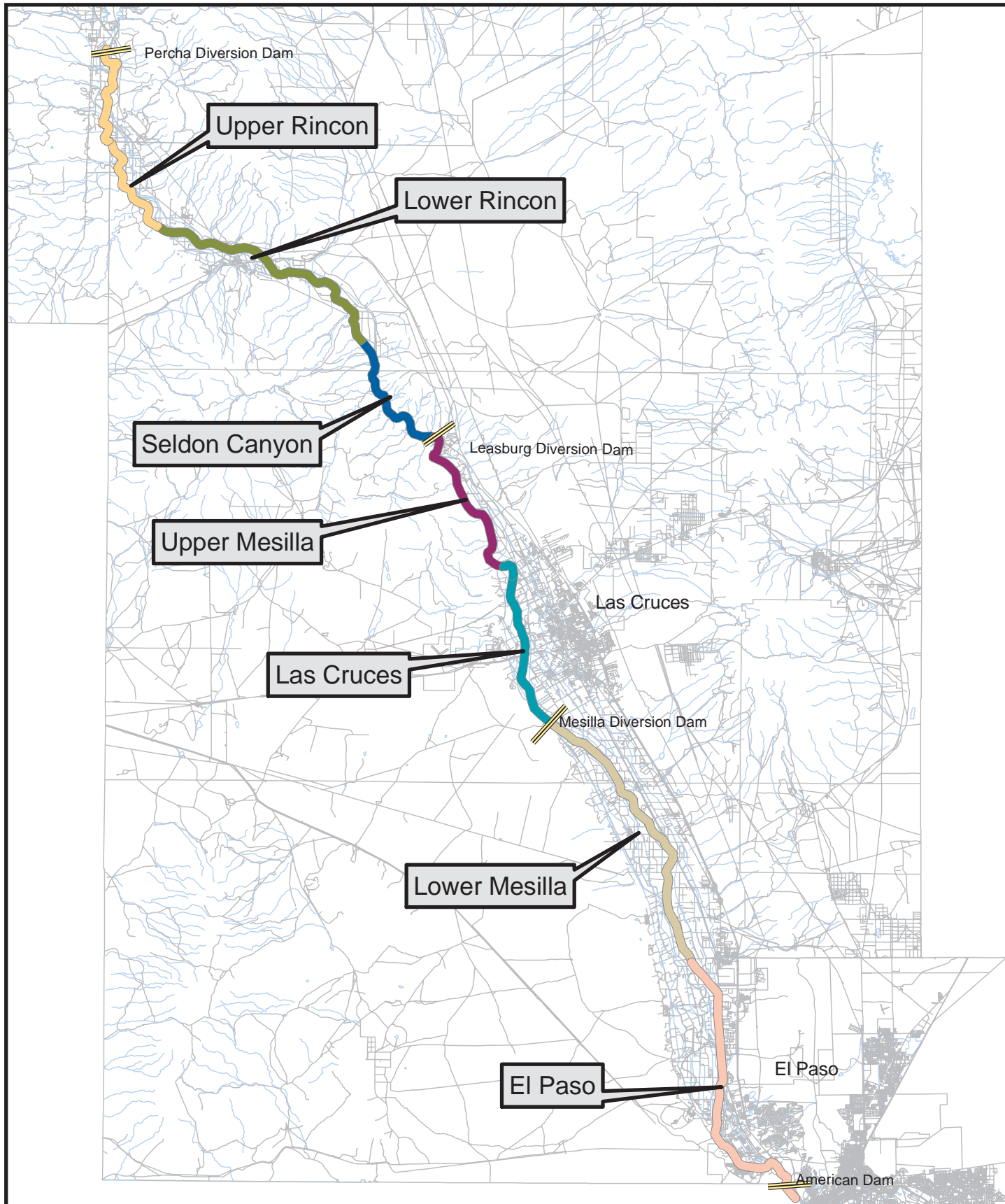
The RGCP flood control system was constructed in conjunction with the canalization project from 1938 to 1943. The system was designed to provide protection from a storm of large magnitude with a very low probability of occurrence, the 100-year storm (probability of one event every 100 years). Flood control in the RGCP relies on upstream flow regulation as well as the use of levees to contain high-magnitude flooding in areas with insufficient natural terrain elevation.

Flood control levees extend for 57 miles along the west side of the RGCP, and 74 miles on the east side for a combined total of 131 miles. Naturally elevated bluffs and canyon walls contain flood flows along portions of the RGCP that do not have levees. The levees range in height from about 3 feet to about 18 feet and have slopes of about 3:1 (length to width) on the river side and 2.5:1 on the “land” side. The levees have a gravel maintenance road along the top.

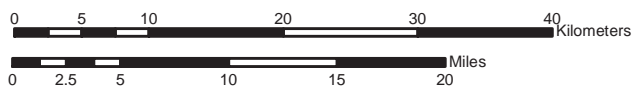
The levees are positioned on average about 750 to 800 feet apart north of Mesilla Dam and 600 feet apart south of Mesilla Dam. The floodway between the levees is generally level or uniformly sloped toward the channel. The floodway contains mostly grasses, some shrubs, and widely scattered trees. The bank of the channel at the immediate edge of the floodway is typically vegetated with a narrow strip of brush and trees. Levees were originally built to provide 3 feet of freeboard during the design flood in most reaches.

Levees are inspected regularly at the beginning of each flood season and immediately after each flood event. Maintenance includes encouraging grass growth on the levee slopes for erosion control, cutting brush and tall weeds from the slopes, and repairing levee slopes. Levee slopes are mowed to prevent growth of brush and trees that could obstruct flows, or cause root damage to the structure itself.

Levee roadways are generally unpaved gravel roads designed for passage of O&M personnel and equipment. Levee maintenance includes road grading and road resurfacing with gravel as needed. The entire levee road system for RGCP is resurfaced within a 20-year cycle.



SCALE = 1 : 570,000 or 1 INCH = 47,500 FEET  
UTM Zone 13 N / NAD 83



**Figure 2-1 Location of River Management Units**



United States Section,  
International Boundary Water Commission

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## **2.2.2 Floodway Management**

### ***Mowing of the Floodway***

Mowing of the floodway outside the main channel but between the flood control levees is maintained to remove obstructions. Mowing of the floodway controls weed, brush, and tree growth, and is conducted at least once each year prior to July 15. Farm tractors with rotary slope mowers are generally used to mow the floodways. Slope mowers are used for vegetation maintenance on the channel banks. Some areas with dense vegetation require a second late summer mowing.

Since 1999 the USIBWC has conducted limited tree planting and maintained provisional test areas (“no-mow” zones) intended to evaluate effects of additional vegetation growth on RGCP functions. Tree planting has been limited to approximately 800 non-irrigated cottonwood poles planted individually at 100-foot intervals. Due to drought conditions in recent years, only a fraction of the poles remain.

Three no-mow zones are currently maintained. The first no-mow zone extends 5 miles on each side of the river, from Percha Dam to the Doña Ana County line, and ranges in width from 10 to 35 feet. At an average 20-foot width, it covers approximately 24 acres. A second no-mow zone extends 5 miles on each side of the river, from Shalem Bridge to Picacho Bridge, where vegetation is allowed to grow for a width of 35 feet. The extent of this no-mow zone is approximately 33 acres. Regular mowing is maintained in areas adjacent to bridges (400 feet upstream and downstream from the structure) and access points to the river (100-foot segments located at 800-foot intervals). In combination, the two no-mow zones previously described cover less than 1 percent of the 8,332-acre floodway within the ROW. A third no-mow zone corresponds to Seldon Canyon where USIBWC historically has not conducted mowing operations, as the agency’s jurisdiction is limited to the channel bed and stream bank.

### ***Grazing Leases***

The USIBWC administers a land lease program in the RGCP. Currently, approximately 43 percent of the total 8,332 acres of the RGCP floodway are leased. No permanent structures may be constructed on the RGCP floodway. By leasing land within the floodway, the need for mowing is reduced (USIBWC 2000).

## **2.2.3 Maintenance of Pilot Channel and Irrigation Facilities**

### ***Channel Maintenance***

Maintenance of the pilot channel is performed during non-irrigation periods when water levels are lowest. The RGCP main channel is maintained by removing debris and deposits, including sand bars, weeds, and brush that grow along the bed and banks. Any major depositions or channel closures caused by sediment loads from arroyo flows are removed.

Channel excavation is performed with bulldozers, excavators, front end loaders, and scrapers either from the channel bank or from within the channel. Normal maintenance work on the main channel is conducted during the non-irrigation and non-flood seasons from September 15 to March 1. Islands and sandbars with vegetation may remain in place as long as the river's carrying capacity is not significantly affected. If required, annual maintenance includes placement of additional riprap to protect meandering channel and stream banks. Any scouring or gouging of the banks due to flooding is repaired immediately.

Because the 1970 dams in tributary basins control over one-third of the upper RGCP basin north of Leasburg Dam (USACE 1996), dredging of the main channel has been conducted infrequently. A study on the scour and deposition of sediments within the main RGCP channel was conducted by the USACE (1996) as part of a functionality evaluation of the RGCP. The extent of bed elevation changes in the channel was evaluated for low, high, and 100-year flows.

The USACE study estimated that consecutive years of low flow conditions would result in only minor scour and deposition along the river. A more significant scour (maximum 2.6 feet) and deposition (maximum of 1 foot) were estimated for a 10-year period of consecutive elevated flows. For a 100-year flood, changes ranged from a maximum deposit of 0.7 feet to maximum scour of 1.7 feet. A more significant deposition (greater than 5 feet of sediment) was predicted for a limited number of channel cross sections downstream from Rincon Arroyo, Trujillo Canyon, Tierra Blanca Canyon, Placitas Arroyo, and Faulkner Arroyo (USACE 1996).

### ***Maintenance of Irrigation Facilities***

Drainage and irrigation structures in the RGCP are licensed to other entities by the USIBWC. The USIBWC Project Manager confirms that the licensee adequately maintains the structures, and that all inlet and outlet channels to the structures are kept open and free of debris.

The Hatch and Rincon Siphons, operated and maintained by USIBWC and Elephant Butte Irrigation District (EBID), are subject to erosive forces that, if not controlled, would impact the integrity of the structures. The USIBWC and EBID protect the siphons by maintaining slow-moving backwater with riprap dams across the channel at siphon crossings. Boulders are added periodically to reinforce the dams when excessive flows cause damage. The USIBWC completed engineering construction for erosion protection of the two siphons as well as preliminary design of the Picacho flume (Montgomery Watson 2000, 2001).

### ***Maintenance of American Diversion Dam***

American Diversion Dam, defining the southern boundary of the RGCP, is operated by the USIBWC. The USIBWC Project Manager cooperates and coordinates dam operations with the USBR to ensure that water delivery objectives are met. Normal maintenance of the American Diversion Dam is performed during the non-irrigation season. Three other

diversion dams associated with the RGCP (Percha Dam, Leasburg Dam, and Mesilla Dam) are operated and maintained by EBID.

## **2.2.4 Sediment Management**

### ***Maintenance of NRCS Dams***

Under an agreement with the EBID and Caballo NRCS District (IBM 65-356 dated December 10, 1965 and Supplement No. 1 dated February 15, 1974), the USIBWC is responsible for maintaining five NRCS sediment control dams and associated access roads. This maintenance includes mowing discharge canal slopes; cleaning and maintaining trash racks, intakes, and outlets; repairing fences; and grading access roads. This maintenance allows dams to perform effectively in reducing sediment load to the river and reducing flood potential. The USIBWC monitors the level of sediment in the dams to ensure that outlet gates on the discharge structure are set to the proper level. PL 93-126; Stat. 451, approved October 18, 1973, limits the USIBWC maintenance expenditures to \$50,000 per year. Maintenance work is generally done annually following joint inspections by the USIBWC, NRCS, and EBID personnel.

### ***Sediment Removal from the Mouth of the Arroyos***

The USIBWC conducts dredging at the mouth of the arroyos to maintain grade of the channel bed and ensure the channel conveys irrigation deliveries. Channel excavation is performed with bull dozers, excavators, front end loaders, and scrapers, either from the channel bank or from within the channel.

In 1998 artificial fish habitat structures were placed at 13 locations within the RGCP channel as a mitigation action required by the USACE Clean Water Act Section 404 permit for dredging sediments from the mouth of several arroyos. Three types of structures providing variable water velocity habitat for aquatic organisms were tested in the Upper Rincon Valley: vortex weirs (two structures), embayments (three structures), and rock groins (seven structures). These various structures, built to test their performance as fish habitat, were monitored over a 3-year period, and most are currently silted and no longer functional.

### ***Sediment Disposal***

Sediment collected from channel excavation, arroyo mouth maintenance, and other sediment control efforts is deposited on the floodway, on upland spoil areas, or on other federal or private lands approved for this purpose.

## **2.3 FLOOD CONTROL IMPROVEMENT ALTERNATIVE**

The primary focus of this Alternative is to address known or potential flood control deficiencies in the RGCP. Key features of this Alternative are to:

- Improve the levee system in terms of flood containment capacity (potential for peak water levels to reach the levees); and
- Improve erosion control in uplands and floodway to reduce sediment load to the RGCP and improve water quality.

Although the actions described below are primarily intended to improve RGCP functionality, they offer opportunities for environmental improvements in the river and floodway. For instance, backwaters associated with erosion protection structures provide a valuable fish habitat, while sediment management practices could lead to reduced dredging and improved wildlife habitat.

### **2.3.1 Levee System Management**

#### ***Current Practices***

The Flood Control Improvement Alternative would retain routine maintenance of the levee system in terms of inspections, erosion, vegetation control, and levee road maintenance.

#### ***Flood Containment Capacity Evaluation***

In addition to routine levee maintenance, this Alternative takes into consideration a potential increase in flood containment capacity. Flood containment capacity, as evaluated in 1996 by the USACE, identified a number of potential deficiencies in the RGCP on the basis of hydraulic modeling of the 100-year storm. Those findings were re-evaluated as part of the development of the DEIS to include potential effects of environmental measures such as vegetation growth in the floodway (Parsons 2001a; 2003).

Table 2.1 presents current estimates of the need to increase levee height or build new levees in the RGCP. Data are presented for the entire length of the RGCP and subdivided geographically by RMU. Construction of a 2.8-mile floodwall in the Canutillo area to replace a discontinuous railroad berm would be a priority action for flood control (USACE 1996). Most of the potential levee deficiencies are located in the southern, mostly urbanized reaches of the RGCP (El Paso RMU). Potential deficiencies were also identified for 8.8 miles of unconfined RGCP sections where simulated flood levels could extend past the ROW. Approximately 3 miles of unconfined ROW fall within government-controlled land where extending the floodplain past the ROW boundary is acceptable. Therefore, only 6 miles of new levee are projected.



**Table 2.1 Estimated Needs for Levee Rehabilitation for the Flood Control Improvement Alternative**

	RIVER MANAGEMENT UNIT							
	ENTIRE RGCP	UPPER RINCON	LOWER RINCON	SELDON CANYON	UPPER MESILLA	LAS CRUCES	LOWER MESILLA	EL PASO
RIVER MILE:	105 - 0	105 - 90	90 - 72	72 - 63	63 - 51	51 - 40	40 - 21	21 - 0
Current Flood Control (miles)								
Unconfined ROW length	81.6	24.0	9.6	18.0	14.0	1.9	0.0	14.1
Existing Levees	13	8.0	30.4	0.0	8.0	20.5	38.0	24.7
Total for RGCP (east and west side)	211	32.0	40.0	18.0	22.0	22.4	38.0	38.8
Rehabilitation Measures (miles)								
New levee (6' height)	6.0	0.0	0.6	0.0	0.0	0.0	0.0	5.4
Floodwall (8 ft, Canutillo area)	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.8
Raise levee (2 ft. average)	60.1	0.0	9.0	0.0	5.4	18.2	10.2	17.3
Riprap cover (for velocities >4 ft./sec)	3.2	0.2	1.0	0.0	0.0	0.0	0.9	1.1

### ***Preliminary Flood Control Improvement Estimates***

The Flood Control Improvement Alternative incorporates levee height increase and building of additional levees or floodwalls as the two measures to be considered in the DEIS to increase flood containment capacity. These measures were adopted only as a work assumption to estimate effects of potential construction activities because of the potential overestimation of levee deficiencies in terms of flood containment capacity, and incomplete information on the structural integrity of the levee system. The assumption adopted in the DEIS is that existing levees would be raised to meet freeboard design criteria or new levees would be constructed in unconfined areas where flood levels would extend past the ROW boundary.

Results of this evaluation are required to ascertain the need for a levee rehabilitation program, and to reassess the overall flood control strategy for the RGCP. Such strategy might incorporate the addition of non-structural flood control measures such as flood easement acquisitions, limited levee setbacks to increase flood dissipation in the floodway, and/or removal of sediment within the floodplain that was deposited from dredging operations since project inception.

In areas where rebuilding of levees would be required, existing levee material would be re-engineered with clay material to meet specifications for the new levee. Additional material would be obtained from sediment removed from the active river channel as a result of maintaining channel capacity or from new borrow sites. Other sources of levee material would be from implementation of environmental measures such as lowering the bank in the form of successively low benches to promote establishment of cottonwood/willow seedlings, and reopening of old meanders.

### **2.3.2 Floodway Management**

#### ***Mowing of the Floodway***

No changes are proposed relative to the No Action Alternative.

#### ***Modified Grazing Practices***

A management program would be developed and implemented in coordination with the NRCS to improve erosion control in areas within the ROW currently leased for grazing. Those areas include the floodway and uplands where the sloped terrain is more susceptible to erosion during storm events. The program would adopt additional best management practices (BMP) according to conditions at each specific location. These BMPs would include physical methods such as placement of erosion control blankets in areas not yet vegetated, modified guidelines for livestock grazing leases, and monitoring to ensure vegetation is properly maintained.

Currently livestock grazing is allowed on 3,552 acres of RGCP land through leases (USIBWC 1994). Grazing can impact riparian areas leading to a higher weed cover, or trampling and creation of trails, which are susceptible to erosion due to over-concentration of cattle (Kaufman and Krueger 1984). BMPs identified would be implemented within the framework of the USIBWC directive for management of grazing leases (USIBWC 2002). This directive assigns responsibilities for monitoring grazing leases, and requires lease renewals to be in compliance with USEPA's guidance for grazing in public lands (USEPA 1994), and Pollution Prevention/Environmental Impact Reduction Checklist for Grazing (<http://es.epa.gov/oeca/ofa/pollprev/graze.html>).

Details concerning the modified grazing program would be developed in concert with regulatory agencies. However, it is assumed that uplands grazing regimens would be modified to promote forage production for the purposes of wildlife and watershed protection. Subsequent vegetative response would result in increased vegetation cover and reduced soil erosion. The grazing program could include vegetative treatments such as seeding, prescribed burns, and mechanical thinning of woody vegetation. The purpose of the treatments is to increase species and structural diversity, reduce soil erosion, and increase the amount of cool season grasses.

It is anticipated that floodway grazing in some leases could be suspended temporarily until the vegetation responds at the appropriate level, at which time grazing would be reinstated to manage forage production. Cessation of grazing from riparian areas until riparian function is restored is consistent with current U.S. Bureau of Land Management (BLM) guidelines (BLM 1993). Modification of the floodway grazing regime would be adjusted based on site-specific conditions to achieve the desired community.

Based on vegetation response, salt cedar control and or mowing could be implemented to reduce recruitment of invasive vegetation. The USIBWC would implement additional BMPs for erosion control that could include: 1) reducing mowing frequency and/or increasing

mowing height to allow some vegetation recovery; 2) rotating mowing between grazing leases; 3) reducing frequency and extent of grading operations within the floodway; 4) mulching and seeding graded areas to minimize erosion; and 5) using erosion control fabric, silt fences, hay bales, and other measures to prevent erosion.

### **2.3.3 Maintenance of Pilot Channel and Irrigation Facilities**

No changes are proposed relative to the No Action Alternative.

### **2.3.4 Sediment Management**

No changes are anticipated with respect to the No Action Alternative in maintenance of sediment control dams and sediment removal from arroyos. Sediment disposal, however, would be conducted primarily outside the ROW.

## **2.4 INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE**

This Alternative incorporates environmental measures within the floodway in combination with actions for flood control improvement, erosion protection, and reassessment of sediment management practices as previously identified for the Flood Control Improvement Alternative. The Integrated USIBWC Land Management Alternative restricts all environmental measures to RGCP lands under USIBWC jurisdiction. Key features of this Alternative are to:

- Develop a riparian corridor for bank stabilization and wildlife habitat by lowering the stream bank (“shavedown”) and native plantings; and
- Promote development of native grasses in combination with salt cedar control to create “beads” surrounding and connecting riparian bosque.

### **2.4.1 Levee System Management**

#### ***Current Practices***

This Alternative retains routine maintenance of the levee system in terms of levee erosion, vegetation control, and levee road maintenance.

#### ***Flood Containment Capacity Evaluation***

The Alternative incorporates a re-evaluation of the RGCP flood containment capacity as previously described for the Flood Control Improvement Alternative, with an increase in floodway vegetation. Use of levee rehabilitation by height increase and additional levee / floodwall construction was incorporated into the Alternative as a work assumption in the DEIS to estimate potential effects of construction activities. Input data for the Targeted River Restoration Alternative, which incorporates moderately smaller floodway vegetation growth, were used in the simulation, and the results applied without modification to the Integrated

USIBWC Land Management Alternative. Modeling results indicated an increase in levee rehabilitation due to greater amount of vegetation on the floodway relative to the Flood Control Improvement Alternative (Table 2.2).

**Table 2.2 Potential Levee Rehabilitation for the Integrated USIBWC Land Management and Targeted River Restoration Alternatives**

		RIVER MANAGEMENT UNIT						
	ENTIRE RGCP	UPPER RINCON	LOWER RINCON	SELDON CANYON	UPPER MESILLA	LAS CRUCES	LOWER MESILLA	EL PASO
RIVER MILE:	105 - 0	105 - 90	90 - 72	72 - 63	63 - 51	51 - 40	40 - 21	21 - 0
Current Flood Control (miles)								
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Total for RGCP	211	32.0	40.0	18.0	22.0	22.4	38.0	38.8
Rehabilitation Measures (miles)								
New levee (6' height)	6.0	0.0	0.6	0.0	0.0	0.0	0.0	5.4
Floodwall (8 ft, Canutillo area)	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.8
Raise levee (2 ft. average)	63.1	0.0	10.5	0.0	5.7	18.7	10.5	17.3
Riprap cover (for velocities >4 ft./sec)	3.2	0.2	1.0	0.0	0.0	0.0	0.9	1.1

## 2.4.2 Floodway Management

Two measures considered under the No Action Alternative are modified under the Integrated USIBWC Land Management Alternative, namely management of grazing leases and annual vegetation mowing. For grazing leases, additional BMPs would be incorporated into a management program to improve erosion control within the RGCP. For vegetation management, four measures described below are incorporated to partially replace mowing in various reaches of the RGCP:

- Modified grassland management;
- Native vegetation planting;
- Bosque enhancement; and
- Reconfiguration of stream banks for regeneration of native woody vegetation (shavedowns).

### ***Modified Grassland Management***

Currently both floodway and levee slopes in the RGCP are mowed at least once a year prior to July 15. The purpose of mowing is to control growth of shrubs and trees, primarily salt cedar. Salt cedar can reach up to 9 feet in height in a single growing season and must be controlled annually. The modified grassland management would replace current mowing

regimes in selected areas to improve wildlife habitat by 1) increasing vegetation diversity, 2) developing native herbaceous vegetation, and 3) improving the riparian corridor and upland/riparian interface. To continue providing salt cedar control, control methods such as herbicide, mechanical (mowing), manual and/or burning would be instituted. Site-specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Site preparation, salt cedar treatments (e.g. mowing followed by herbicide) and shallow disking to prepare soil and chemical treatments (salinity management);
- Seeding of native vegetation; and
- Maintenance and monitoring.

Maintenance would include continued salt cedar control using treatments specific to site conditions, and vegetation treatments which promote establishment and sustainment of native species. Monitoring would be in place to assess treatment results and modify methods as appropriate.

The modified grassland management areas are outside the hydrologic floodplain and would be dominated by intermediate and xeric native species. Depressions and shallow groundwater interspersed within these areas would support mesic and hydric vegetation, potentially creating additional diversity and improved wildlife habitat.

### ***Native Vegetation Planting***

Planting is the environmental measure used to establish native riparian vegetation in areas not in proximity to the river. Restoration by planting may be accomplished through seeding, transplants, and pole planting. Depending on the planting method, establishment could require irrigation or micro-irrigation to increase the probability of success (Dressen *et al.* 1999).

***Seeding.*** Seeds of native plants can be purchased from suppliers or collected from nearby areas and distributed in the floodway. Success of seedling establishment must be accompanied by clearing competing vegetation, particularly invasive exotic species.

***Transplants.*** Trees, shrubs, and herbaceous plants may be transplanted into riparian zones. A few well established individuals can help contribute seeds to the site as well as provide immediate wildlife benefits.

***Pole Planting.*** This technique involves obtaining long poles, or branches, from live trees and planting them in holes. Cottonwoods and willows are two species that can be successfully grown from poles. Areas would be planted with trees approximately 3 years old, placing the poles directly in contact with shallow ground water. This is accomplished by digging a hole with an auger to the water table. Poles are then pushed through so the root system is in contact with the water and the hole is refilled with dirt. Poles must be planted while they are dormant (*i.e.*, from January through April of each year). Poles are usually wrapped with chicken wire to protect them from girdling by beavers.

Researchers have increased the success of pole planting through such methods as 1) using very long poles inserted into holes drilled to the groundwater; 2) drilling holes to groundwater, backfilling with soil or mulch, and planting poles on top of the backfilled hole; 3) irrigating poles until their roots have reached groundwater; and 4) promoting root growth by applying rooting hormone compounds. Site specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Detailed site survey, including soil analyses, groundwater level assessment, micro topography survey *etc.*;
- Site preparation, including removal of established salt cedar and treatment of suppressed (recently mowed) salt cedar;
- Soil preparation, including physical (*i.e.* disking) and chemical treatments (salinity management);
- Seeding or planting of native vegetation; and
- Implementation of a maintenance and monitoring plan

Maintenance would include continued salt cedar control using treatments specific to site conditions. Salt cedar control would be required to reduce competition between native plants and invasive species and reduce fuel loads. Monitoring would be in place to assess treatment results and modify methods as appropriate.

### ***Bosque Enhancements***

This measure involves selective removal of exotic vegetation in existing bosques to allow establishment of native vegetation (Southwest Environmental Center [SWEC] 2002). Sites selected for bosque enhancement include wooded areas within the hydrologic floodplain. The process of selective removal would likely be extended to other restored areas as a long-term practice once riparian vegetation became established. Site specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Detailed site survey, including soil analyses, groundwater level assessment, and micro topography survey;
- Site preparation, including removal of established salt cedar;
- Hauling and disposal of salt cedar (burning, chipping, or piled as slash);
- Soil preparation, including salinity management;
- Seeding or planting of native vegetation, and
- Maintenance and monitoring.

Maintenance would include continued salt cedar control using treatments specific to site conditions. Salt cedar control would be required to reduce competition between native plants

and invasive species and reduce fuel loads. Monitoring would be in place to assess treatment results and modify methods as appropriate.

### ***Reconfiguration of Stream Banks for Native Woody Vegetation Regeneration (Shavedowns)***

This measure would allow overbank flooding within the floodway by shaving down the banks to within 1 foot of the irrigation flows to promote inundation during moderately-high storm flows. The process of shaving down would reconnect portions of the river and former floodplain. Overbank flooding within the floodway would provide conditions suitable for establishment and maintenance of native riparian species, particularly cottonwoods, whose seeds have a short period of viability and will only germinate in moist soil (Stromberg and Patton 1991). Implementing this environmental measure would sufficiently lower the floodway at selected locations and allow for potential inundation during the months of March and April. Site-specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Detailed site survey, including soil analyses, groundwater level assessment, and micro topography survey;
- Site shavedown and relocation of soil to levee and floodway;
- Hauling and disposal of salt cedar (burning, chipping, or piled as slash);
- Soil preparation, including salinity management;
- Seeding or planting of native vegetation; and
- Maintenance and monitoring.

Maintenance would include continued salt cedar control using treatments specific to site conditions. Salt cedar control would be required to reduce competition between native plants and invasive species and reduce fuel loads. Monitoring would be in place to assess treatment results and modify methods as appropriate.

***Lowering of Stream Banks.*** Cottonwood regeneration through overbank flows would require land preparation, including disking, shavedowns, and partial excavation of areas inundated at peak flow levels. Excavation would be performed in selected locations of the floodway to re-shape the bank, forming a series of low terraces subject to intermittent overflows and allowing the establishment of vegetation adapted for those patterns. This measure is based on the partial stream restoration concept successfully implemented in the Middle Rio Grande at the Overbank Flow Project near Albuquerque, New Mexico, and the Bosque del Apache National Wildlife Reservation (Crawford *et al.* 1999).

***Best Management Practices.*** BMPs would be applied for bank protection and would increase the probability of vegetation development as bank shavedowns exposed to high water velocities may not support a diverse riparian habitat. Three strategies for bank protection that would be utilized are back flooding, bench configuration, and land grading. A maintenance and monitoring plan would also be implemented.

**Back Flooding.** Back flooding is a method whereby river water enters a drainage channel that is lower than river elevation through a downstream cut in the bank and minimizes the runoff distance when river water recedes. Backflooding minimizes water velocity over excavated areas until vegetation is established. This construction method would create a habitat similar to opening a former meander to the river on the downstream end. For bank shavedown areas located on the outer bend of the river, a river diversion barrier parallel to the river and between the bank shavedown area and the river would be used to slow overbank flows ([http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con\\_site.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm)).

**Bench Configuration.** The stream bank would be lowered in the form of up to three successively low benches, and then a few broad and shallow side channels would run through the benches to promote better seedling establishment.

**Land Grading.** A grading plan would be prepared that establishes which areas of the site will be graded, how drainage patterns will be directed, and how runoff velocities will affect receiving waters. The grading plan would also include information regarding when earthwork will start and stop, the degree and length of finished slopes, and where and how excess material will be disposed. Berms, diversions, and other storm water practices that require excavation and filling would also be incorporated into the grading plan.

### **2.4.3 Maintenance of Pilot Channel and Irrigation Facilities**

No changes are expected relative to the No Action alternative.

### **2.4.4 Sediment Management**

No changes are expected associated with the No Action Alternative regarding maintenance of sediment control dams and sediment removal from arroyos. Sediment disposal, however, would be conducted primarily outside the ROW.

## **2.5 TARGETED RIVER RESTORATION ALTERNATIVE**

Relative to the previous Alternatives, the Targeted River Restoration Alternative emphasizes environmental measures associated with partial restoration of the RGCP, such as various methods for riparian corridor development, and opening of meanders and modification of arroyos to increase aquatic habitat diversification. Native vegetation establishment by overbank flows would be induced by controlled water releases from Caballo Dam during high storage conditions in Elephant Butte Reservoir. Environmental measures would also extend beyond the ROW through voluntary conservation easements to preserve wildlife habitat and encourage bosque development. This Alternative also includes actions previously identified for flood control improvement. Key features of this Alternative are to:

- Develop a riparian corridor for bank stabilization and wildlife habitat;
- Increase opportunity of overbank flows using controlled water releases;



- Manage grasslands in combination with salt cedar control to “connect” riparian bosque locations in the floodway and river/upland ecotone;
- Reopen low-elevation meanders, in addition to arroyo habitat, to provide backwater habitat and associated riparian vegetation; and
- Establish voluntary conservation easements outside the ROW to preserve remnant bosques and wetlands, create bosque and grassland habitat, and increase the width of the river corridor.

### **2.5.1 Levee System Management**

#### ***Current Practices***

The Targeted River Restoration Alternative retains routine maintenance of the levee system in terms of levee erosion and vegetation control, and levee road maintenance.

#### ***Flood Containment Capacity Evaluation***

The Alternative incorporates re-evaluation of the RGCP flood containment capacity as previously described for the Integrated USIBWC Land Management Alternative. Use of levee rehabilitation by height increase and additional levee / floodwall construction was incorporated into the Alternative as a work assumption to estimate effects of potential construction activities in the DEIS.

### **2.5.2 Floodway Management**

Management of grazing leases and annual vegetation mowing, as currently conducted under the No Action Alternative, are modified under the Targeted River Restoration Alternative. For grazing leases, additional BMPs would be incorporated into a management program to improve erosion control within the RGCP floodway.

For vegetation management, development of a riparian corridor would be accomplished by the planting and enhancement of native woody vegetation, as well as modified grassland management. Under the Targeted River Restoration Alternative these measures would be complemented by use of seasonal peak flows to promote natural regeneration of riparian bosque, and use of conservation easements outside the ROW for connectivity with uplands. These two additional measures are described below.

#### ***Controlled Water Releases for Overbank Flooding***

This measure would temporarily modify stream flows, allowing flood surges over the floodway to simulate historical overbank flows. Controlled releases from Caballo Dam up to a maximum flowrate of approximately 3,600 cubic feet per second (cfs) above typical irrigation levels, would be scheduled to simulate spring/summer overbank flooding in the upper reaches of the RGCP. These discharges would be a combination of coordinated

irrigation deliveries and additional water releases from the purchase of water rights, and would be limited to high water storage conditions in Elephant Butte Reservoir.

Due to greater availability of potentially inundated floodway and proximity to the water release point (Caballo Dam), regeneration of native woody vegetation would take place largely in the Rincon Valley. A total of 516 acres have been identified as potentially inundated areas within the RGCP. The acreage by RMU is subsequently presented in the description of the linear projects for the Alternatives.

Land preparation would include disking to remove vegetation, and partial shavedowns of stream banks. The ability to control the timing and intensity of flows has two primary advantages over shavedowns alone:

- Timed releases would ensure inundation during optimum cottonwood seed germination periods rather than by chance through storm events. This would ensure that bank preparation would not be in vain if a storm event did not occur; and
- Bank preparation (soil disturbance) in many locations could be conducted by disking rather than excavating since relatively higher water levels would be achieved through controlled releases.

### ***Voluntary Conservation Easements Outside ROW***

This measure would incorporate lands outside the ROW for environmental improvements through conservation easements sponsored by federal agencies. Available programs include the National Parks Service Land and Conservation Fund, the USACE Continuing Authorities Program (Sections 206 and 1135 for ecosystem restoration), and NRCS programs for conservation reserves, wetlands reserves, wildlife habitat incentives, and environmental quality incentives. Areas identified for potential easements include remnant bosques and uplands, as well as some croplands. A total 1,618 acres of potential conservation easements have been identified in areas adjacent to the RGCP. The acreage by RMU is subsequently presented in the description of the linear projects for the Alternatives.

The main function of easements would be to enhance the connectivity of riparian communities with upland areas, provide buffer zones, and increase corridor width. For existing bosques and undeveloped lands, the main purpose of easements would be to control their conversion to an alternate use. Management options for easements in agricultural lands include developing native grasslands in combination with salt cedar control, and reducing maintenance along sections of irrigation drains or canals to extend riparian vegetation and wetlands.

Along Seldon Canyon, where USIBWC has no land ownership, conservation easements were identified primarily in association with controlled water releases from Caballo Dam for overbank flows.

### **2.5.3 Maintenance of Pilot Channel and Irrigation Facilities**

#### ***Current Practices***

Under this Alternative routine maintenance of the pilot channel would be continued as well as maintenance of American Diversion Dam and irrigation facilities. Partial changes in channel configuration would be introduced in the Rincon Valley by reopening of former meanders within the ROW.

#### ***Reopening of Meanders Within the ROW***

Re-establishment of six former meanders eliminated during construction of the RGCP would be conducted for diversification of aquatic habitat, to maintain hydraulic connectivity, and to provide shelter for fish and invertebrates species. The reopened meanders would provide slow-moving waters during the late spring and early summer, a required condition for breeding and spawning of various native fish species. Such a condition is uncommon in the RGCP because that period coincides with high flows of the main irrigation season.

Reopening of meanders within the ROW would typically be done in the form of high-flow side channels. These structures would divert water during high flow periods, route it through a more shallow waterway with slower velocities, and return it downstream to the main channel. Backwater conditions would occur during low flow periods. Significant excavation within the ROW would be required to develop the gradually sloping banks of the channel to provide aquatic and riparian habitat. Excavated meanders, with a combined surface area of 147 acres would be converted to 30 percent open water and 70 percent native bosque using shavedowns and/or plantings. Site-specific conditions would dictate the method or combination of methods used. Measure implementation would include:

- Detailed site survey;
- Excavation;
- Hauling and disposal of salt cedar (burning, chipping, or piled as slash);
- Soil preparation, including salinity management;
- Seeding or planting of native vegetation; and
- Maintenance and monitoring.

Maintenance would include continued salt cedar control using treatments specific to site conditions. Salt cedar control would be required to reduce competition between native plants and invasive species and reduce fuel loads. Monitoring would be in place to assess treatment results and modify methods as appropriate.

## **2.5.4 Sediment Management**

### ***Current Practices***

Under this Alternative maintaining five NRCS sediment control dams and associated access roads would be conducted as indicated for the No Action Alternative, while sediment disposal would be conducted primarily outside the ROW. Changes would also be introduced for sediment removal from the mouth of the arroyos.

### ***Arroyo Dredging for Habitat Diversification***

Changes in sediment removal from the mouth of the arroyos would be introduced in this alternative for diversification of fish habitat. This measure entails excavating the entrances of selected arroyos to increase the amount of backwater and bottom variation to increase the amount of slow-moving waters during the late spring and early summer. Twelve major arroyos in the Rincon Valley have been identified as having the most significant potential for diversification of aquatic habitat.

## **2.6 COMPARISON OF ALTERNATIVE FEATURES**

Table 2.3 presents a comparison of measures by management category for all Alternatives. Most measures under consideration are associated with floodway management under the Integrated USIBWC Land Management and Targeted River Restoration Alternatives. Levee rehabilitation and sediment disposal apply to all action alternatives. The Targeted River Restoration Alternative also includes measures for diversification of the aquatic habitat (modified dredging of arroyos and reopening of meanders).

## **2.7 ENVIRONMENTAL MEASURES AND ASSOCIATED PROJECTS**

Environmental measures represent river restoration techniques to foster development of riparian corridor and/or diversify aquatic habitat. Environmental measures were arranged as projects for a given site or reach of the RGCP. Projects were classified as either linear or point projects based on their geographic coverage along the RGCP.

### **2.7.1 Linear Projects**

Linear projects, each extending over several miles of the RGCP, were organized by distinct geographic reaches within RMUs. Four environmental measures are described as linear projects:

- Modification of grazing practices in the floodway and uplands to control erosion and reduce sediment load;

**Table 2.3 Comparison of Alternative Measures**

MANAGEMENT CATEGORY	NO ACTION ALTERNATIVE	FLOOD CONTROL IMPROVEMENT ALTERNATIVE	INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE	TARGETED RIVER RESTORATION ALTERNATIVE
Levee System Management	Routine levee/ road maintenance	No change	No change	No change
	n/a	Levee system improvements	Levee system improvements	Levee system improvements
Floodway Management	Unmodified grazing leases	Modified leases for erosion control (3,552 acres)	Modified leases for erosion control (3,552 acres)	Modified leases for erosion control (3,493 acres)
	Continued mowing (4,657 acres)	No change	Continued mowing (2,674 acres)	Continued mowing (2,223 acres)
			Modified grassland management (1,641 acres)	Modified grassland management (1,641 acres)
			Native vegetation planting (223 acres)	Native vegetation planting (189 acres)
			Stream bank reconfiguration (127 acres)	Seasonal peak flows / bank preparation (516 acres)
	n/a	n/a	n/a	Voluntary conservation easements (1,618 acres)
Channel and Facilities Management	Debris removal and channel protection	No change	No change	No change
	American Dam and irrigation structures maintenance	No change	No change	No change
	n/a	n/a	n/a	Reopening of six former meanders (147 acres)
Sediment Management	NRCS Sediment dam maintenance	No change	No change	No change
	Sediment removal from arroyos / mitigation actions	No change	No change	Modified arroyo dredging for aquatic habitat (7 acres)
	Disposal from dredging pilot channel	Disposal mainly outside ROW	Disposal mainly outside ROW	Disposal mainly outside ROW
	Disposal from environmental measure excavation	n/a	Disposal inside ROW	Disposal inside ROW

- Modification of grassland management practices (mowing regimes) in the floodway;
- Use of seasonal peak flows to promote regeneration of native riparian vegetation (cottonwoods and willows); and
- Use of voluntary conservation easements (agriculture and preservation easements).

Each linear project is identified by the two initial letters of the RMU in which they are located, followed by a number that represents a proposed measure. Table 2.5 is a matrix presenting the project and associated Alternatives. Figure 2.2 illustrates the distribution of linear projects along the RGCP.

**Table 2.4 Linear Project Identification and Acreage**

RMU	MEASURE 1: MODIFIED GRAZING IN UPLANDS AND FLOODWAY		MEASURE 2: MODIFIED GRASSLAND MANAGEMENT IN THE FLOODWAY		MEASURE 3: CONTROLLED RELEASES FROM CABALLO DAM FOR OVERBANK FLOWS*		MEASURE 4: VOLUNTARY CONSERVATION EASEMENTS	
	Project:	Acre:	Project:	Acre:	Project:	Acre:	Project:	Acre:
Upper Rincon	UR-1	1911	UR-2	639	UR-3	214		
Lower Rincon	LR-1	473	LR-2	611	LR-3	302	LR-4	536
Seldon Canyon							SC-4 *	808
Upper Mesilla	UM-1	638	UM-2	22			UM-4	28
Las Cruces	LC-1	136	LC-2	301				
Lower Mesilla	LM-1	256	LM-2	68			LM-4**	202
El Paso	EP-1	138					EP-4	44
All RMUs		3,552		1,641		516		1,618
Associated with Alternative:	All Action Alternatives		Integrated USIBWC Land Management and Targeted River Restoration		Targeted River Restoration		Targeted River Restoration	

\* Seldon Canyon voluntary conservation easements are associated with measure 3, controlled releases from Caballo Dam.

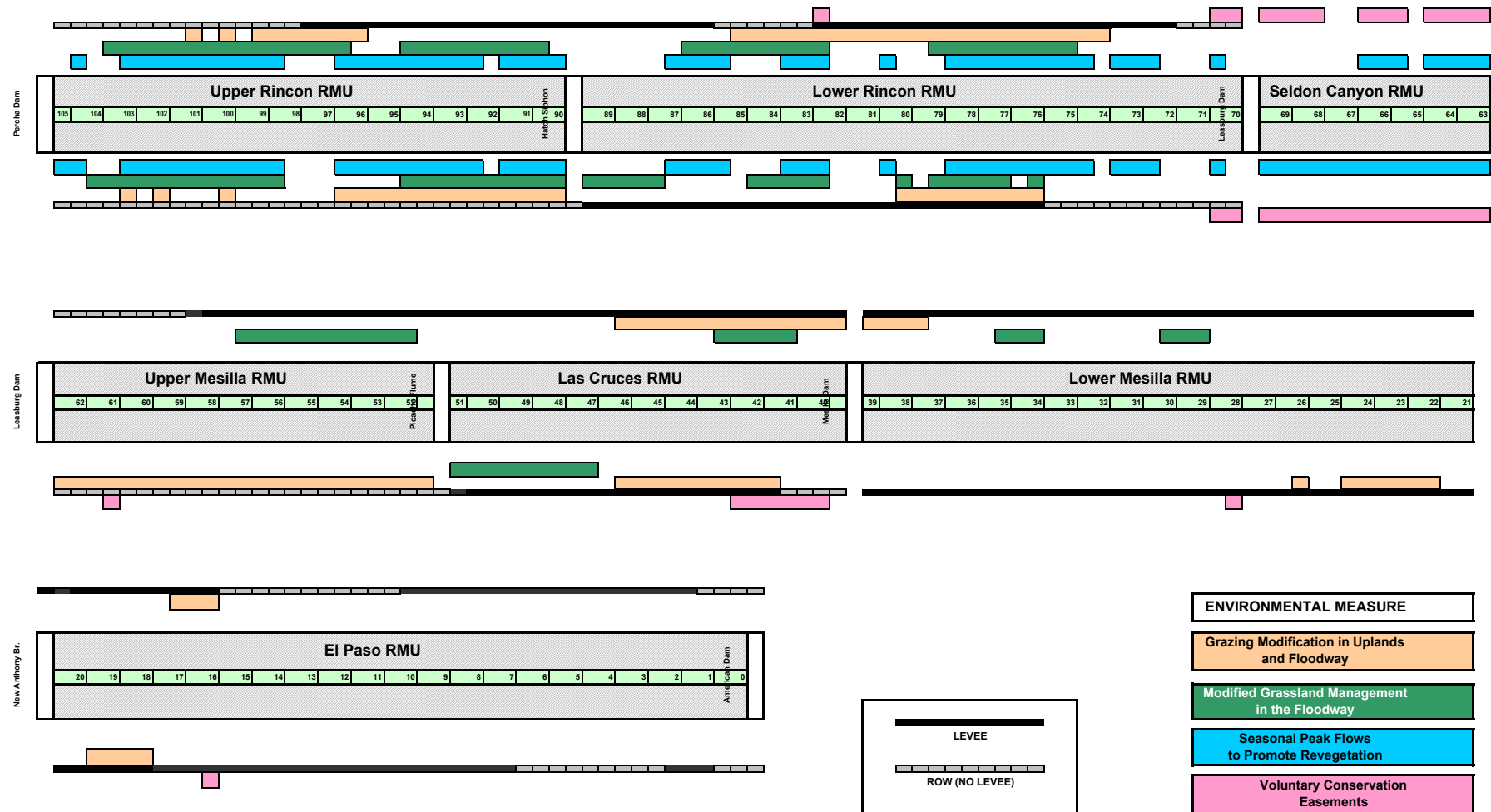
\*\* Overlaps with the Las Cruces RMU. The majority of potential estimates are in the vicinity of a current restoration project, the "Picacho Wetlands Restoration Project" (SWEC 2002).

The Flood Control Improvement Alternative includes six linear projects that entail modification of grazing practices to further reduce erosion in leased areas. Most of the lease areas are located in the Rincon Valley and Upper Mesilla Valley.

The Integrated USIBWC Land Management Alternative includes 11 linear projects associated with changes in grazing leases as well as modified management of floodway vegetation.

The Targeted River Restoration Alternative includes linear projects associated with four types of environmental measures, modified grazing leases, modified grassland management, seasonal peak flows, and voluntary conservation easements.

Figure 2-2 Environmental Measures to be Implemented as Linear Projects



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## 2.7.2 Point Projects

Point projects are limited to site specific locations offering unique opportunities for implementation of environmental measures. Point projects are identified by a number that represents the approximate river mile where they are located, followed by a letter that identifies a specific measure to be implemented. Table 2.5 presents all point projects included in the Integrated USIBWC Land Management and Targeted River Restoration alternatives. The following measures were developed as point projects:

- Planting of native cottonwood and willows within the hydrologic floodplain for riparian corridor development, and/or enhancement of existing bosque;
- Bank shavedowns to promote regeneration of native vegetation;
- Opening of former meanders to diversify aquatic habitat; and
- Modification of dredging at arroyos by creating embayments.

Point projects for the Integrated USIBWC Land Management Alternative focused on improvement and restoration of riparian vegetation. Projects are listed separately for vegetation planting within the hydrologic floodplain and for shavedown of stream banks to promote overbank flooding during moderately high storm flows. Point projects for the Targeted River Restoration Alternative are focused on restoration of the riparian corridor and diversification of the aquatic habitat by reopening low-elevation meanders and modifying arroyo habitat. Figure 2.3 shows the location of point projects in the Rincon and Mesilla Valleys.

## 2.7.3 Summary of Alternatives by Project

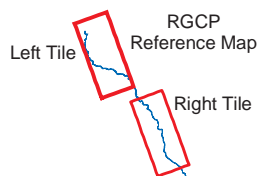
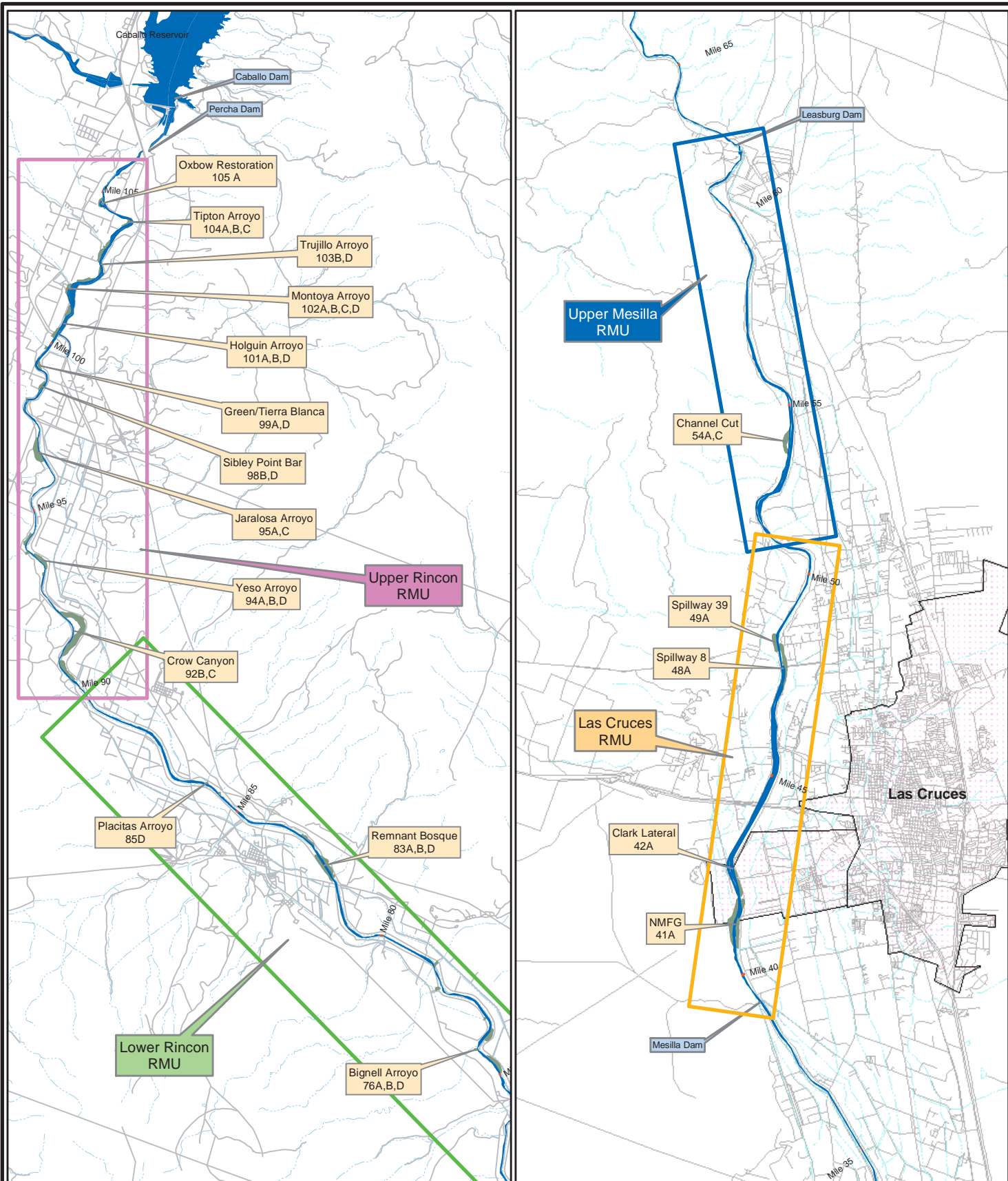
Table 2.6 provides a project list by management category and environmental measure. The applicability of those projects to each of the action alternatives is also indicated.

**Table 2.5 Point Projects Associated with the Integrated USIBWC Land Management and Targeted River Restoration Alternatives**

RIVER MILE ID			INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE		TARGETED RIVER RESTORATION ALTERNATIVE		
			MEASURE A: NATIVE VEGETATION PLANTING	MEASURE B: STREAM BANK SHAVEDOWNS	MEASURE A: NATIVE VEGETATION PLANTING	MEASURE C: OPEN FORMER MEANDERS	MEASURE D: MODIFY DREDGING AT ARROYOS
105	Oxbow Restoration	Project Acres	105A 6.6			105C 6.6	
104	Tipton Arroyo	Project Acres	104A 2.5	104B 3.4	104A 2.5		104D 0.2
103	Trujillo Arroyo	Project Acres		103B 26.5			103D 0.8
102	Montoya Arroyo	Project Acres	102A 2.8	102B 24.7		102C 2.8	102D 0.17

**Table 2.5 Point Projects Associated with the Integrated USIBWC Land Management and Targeted River Restoration Alternatives (...continued)**

RIVER MILE ID			INTEGRATED USIBWC LAND MANAGEMENT ALTERNATIVE		TARGETED RIVER RESTORATION ALTERNATIVE		
			MEASURE A: NATIVE VEGETATION PLANTING	MEASURE B: STREAM BANK SHAVEDOWNS	MEASURE A: NATIVE VEGETATION PLANTING	MEASURE C: OPEN FORMER MEANDERS	MEASURE D: MODIFY DREDGING AT ARROYOS
101	Holguin Arroyo	Project Acres	101A 6.0	101B 12.5	101A 6.0		101D 0.16
99	Green Tierra	Project Acres	99A 5.1		99A 5.1		99D 0.27
98	Sibley Point Bar	Project Acres		98B 4.1			98D 0.27
97	Jaralosa Arroyo	Project Acres				97C 28.0	97D 0.44
95	Jaralosa South	Project Acres	95A 5.1			95C 5.1	
94	Yeso Arroyo	Project Acres	94A 11.5	94B 3.9	94A 11.5		94D 0.44
92	Crow Canyon	Project Acres		92B 17.9		92C 84.6	
85	Placitas Arroyo	Project Acres					85D 0.52
83	Remnant Bosque	Project Acres	83A 16.2	83B 17.9	83A 16.2		83D 0.3
78	Rincon/Reed Arroyo	Project Acres					78D 2.74
76	Bignell Arroyo	Project Acres	76A 10.3	76B 16.3	76A 10.3		76D 0.52
54	Channel Cut	Project Acres	54A 19.6			54C 19.6	
49	Spillway No. 39	Project Acres	49A 15.9		49A 15.9		
48	Spillway No. 8	Project Acres	48A 34.6		48A 34.6		
42	Clark Lateral	Project Acres	42A 15.4		42A 15.4		
41	Picacho and NMGF	Project Acres	41A 71.3		41A 71.3		
<b>Total Acreage:</b>			<b>223</b>	<b>127</b>	<b>189</b>	<b>147</b>	<b>6.8</b>



**Figure 2-3 Distribution of Point Projects in the Rincon and Mesilla Valleys**



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**Table 2.6 Summaries of Projects by Measure and Alternative**

		ALTERNATIVE*		
ENVIRONMENTAL MEASURE	PROJECT LIST	FCI	IULM	TRR
<i>Floodway Management</i>				
Modified grazing leases (erosion control)	UR-1, LR-1, UM-1, LC-1, LM-1, EP-1	X	X	X
Modified grassland management	UR-2, LR-2, UM-2, LC-2, LM-2		X	X
Vegetation planting and bosque enhancement	104A to 48A (14 Projects)		X	X
Stream bank shavedowns	104B to 76B (9 Projects)		X	
Seasonal peak flows / bank preparation	UR-3, LR-3			X
Conservation easements	LR-4, SC-4, UM-4, LM-4, EP-4			X
<i>Pilot Channel Management</i>				
Reopening of former meanders	105C to 54C (6 Projects)			X
<i>Sediment Management</i>				
Modified arroyo dredging for habitat	104D to 76D (12 Projects)			X

\* FCI, Flood Control Improvement; IULM, Integrated USIBWC Land Management; TRR, Targeted River Restoration

## 2.8 IMPLEMENTATION TIMETABLE

Establishing a riparian corridor and aquatic habitat diversification are envisioned as long-term processes that will progress as water is secured and the effectiveness of projects is documented. Direct intervention measures such as pole planting, micro-irrigation, and induced overbank flooding for seedling germination by bank re-shaping and/or controlled water releases, will be initially required to induce development of the riparian corridor. Dredging will be initially required for reopening meanders and creating embayments in arroyos to maintain their functionality.

Once established, riparian vegetation could be sustained through continued use of agricultural practices such as flood irrigation or micro-irrigation and, in some areas, controlled discharges from Caballo Dam during high runoff years. Given the physical limitations for potential releases and available floodable land, overbank flooding appears to be practical mostly in the Rincon Valley. In this area controlled discharges would be gradually increased, as dictated by the success of previous releases, until a selected maximum target for release is achieved. In all areas where expansion of the riparian corridor is anticipated, routine tracking of groundwater depth will be required to ensure adequate conditions for establishment of riparian vegetation (typically less than 10 feet for cottonwoods and willows). Long-term exotic species control would likely be required in all projects.

Monitoring of measures is applied to all Alternatives. Monitoring includes observing the area and/or collecting data for a period of time after implementation to determine if the measures are achieving their intended functions. Regulatory agencies are generally moving in the direction of requiring monitoring. For example, the USACE requires at least 3 years of monitoring of wetlands mitigation, including submittal of written progress reports.

A 20-year timeline was adopted for project implementation. The timeline was divided into three phases. During the 5-year Phase 1, implementation plans would be developed and funded, agreements would be reached for interagency cooperation and water use, and selected projects would be tested at a pilot scale. Project performance would be monitored to determine success, water use, and need for modification, and to conduct an environmental benefit versus investment analysis. Priority projects, as determined by the potential environmental benefit, would be implemented during a 5-year, Phase 2. Remaining projects would be implemented in the subsequent 10 years, in Phase 3. Site prioritization would be conducted according to an adaptive management approach previously discussed. Following Phase 3, environmental measures would be maintained in the long run and, to the extent possible, expanded to sustain the riparian corridor and ensure functionality of aquatic habitat diversification projects. Timetables for linear and point projects, presented in Tables 2.7 and 2.8, respectively, are described below.

**Table 2.7 Implementation Timetable for Linear Projects**

MEASURE		PHASE 1 (YEARS 1-5)	PHASE 2 (YEARS 6-10)	PHASE 3 (YEARS 11-20)	ALTERNATIVE*
Grazing modifications	Actions	Guidelines, Implementation	Guidelines revision, monitoring		FCI, IULM, TRR
	Projects	UR-1, LR-1, LC-1, UM-1, LM-1, EP-1			
Grasslands management	Actions	Guidelines, pilot testing and monitoring	Implementation, monitoring	Monitoring	ILM, TRR
	Projects	UR-2	LR-2, UM-2, LC-2, LM-2		
Peak flows	Actions	Agreements, water acquisition	Implementation, monitoring	Monitoring	TRR
	Projects		UR-3, LR-3		
Conservation easements	Actions	Agreements; target remnant bosques	Implementation	Secure additional easements	TRR
	Projects	LR-4, SC-4	LM-4, EP-4, UM-4		

\* FCI, Flood Control Improvement; IULM, Integrated USIBWC Land Management; TRR, Targeted River Restoration

**Table 2.8 Implementation Timetable for Point Projects**

ALTERNATIVE / MEASURE	MEASURE ID	PROJECTS BY RIVER MILE		
		PHASE 1 PILOT TESTING (YEARS 1-5)	PHASE 2 (YEARS 6-10)	PHASE 3 (YEARS 11-20)
<b>Integrated USIBWC Land Management Alternative</b>				
Planting and bosque enhancement	A	105, 104, 41	102, 101, 99, 94, 95,	83, 76, 54, 49, 48, 42
Stream bank shavements	B	104	103, 102, 101, 98, 94	92, 83, 76
<b>Targeted River Restoration Alternative</b>				
Planting and bosque enhancement	A	104, 41	101, 99, 49, 48, 42	94, 83, 76
Reopening meanders	C	105	102, 54	97, 92, 95
Modified arroyo dredging	D	104	103, 102, 101, 99, 98, 97, 94	85, 83, 78, 76

### 2.8.1 Linear Projects

**Grazing Modifications.** All projects would be completed during Phase 1 and would include development of guidelines, compliance policies, projects implementation, and monitoring programs. Subsequent phases would involve continued implementation, monitoring, and revision of the guidelines as necessary. These projects are the least complex to implement because the measure is limited to change in practices within the ROW. The projects would be conducted throughout most of the RGCP.

**Grassland Management.** Phase 1 includes a single pilot project in the Upper Rincon Valley. The remaining four projects would be implemented in Phase 2 followed by monitoring and modifications to the guidelines as necessary. The projects would be conducted primarily in the Rincon and Mesilla Valleys.

**Peak Flows.** Phase 1 concentrates on water acquisition and agreements for water use by controlled releases from Caballo Dam. Peak flows would be implemented during Phase 2 and 3 coupled with monitoring and modifications as necessary. The projects would be conducted in the Rincon Valley.

**Conservation Easements.** Phase 1 would include development easement agreements and target remnant bosques in the Lower Rincon and Seldon Canyon projects. Phase 1 easements coincide with areas identified for induced overbank flows by controlled water releases. Phase 2 would include easement agreements and project implementation in the Mesilla Valley and El Paso. Target areas are located in the Rincon and Mesilla Valleys.



## 2.8.2 Point Projects

***Planting and Bosque Enhancement.*** Phase 1 includes pilot projects in the Rincon Valley and south of Las Cruces. Pilot projects include two small sites (9.1 acres) and a larger site (71 acres) coinciding with a planned restoration project, the Picacho Wetlands Pilot Project (SWEC 2002). Implementation throughout the RGCP would begin in Phase 2 and Phase 3 after site-specific monitoring and potential modifications are made to the measure. Phase 2 emphasizes the Rincon Valley and Phase 3 completes the Rincon Valley and the remaining RGCP projects.

***Stream Bank Shavedowns.*** Phase 1 includes a single, 3.4-acre pilot project in the Rincon Valley. Implementation throughout the Rincon Valley would begin in Phase 2 and 3 after site-specific monitoring and potential modifications are made to the measure. Phase 2 includes five projects north of Yeso Arroyo, and Phase 3 includes the remaining three projects. Selection of projects was based on a representative example of the measure to test and provide several years of monitoring before larger scale implementation. The projects would be implemented in the Rincon Valley.

***Reopening of Meanders.*** Phase 1 includes a single, 6.6-acre pilot project in the Rincon Valley. After site-specific monitoring and potential modifications are made to the measure, the remaining projects would be conducted. Phase 2 includes two projects (22.4 acres) and Phase 3 includes three projects including the largest restoration project (84.6 acres at Mile 54). The largest and potentially more water-consumptive projects are planned for Phase 2 and 3 after water acquisition agreements can be put into place. Pilot testing would provide several years of monitoring before larger scale projects are implemented.

***Modified Dredging of Arroyos.*** Phase 1 includes a single pilot project in the Rincon Valley. The project coincides with the location other measures involving construction/earth moving. Implementation throughout the RGCP would begin in Phases 2 and 3 after site-specific monitoring, water use agreements and potential modifications are made to the measure. As with Phase 1, these projects would coincide with other measures involving construction/earth moving. Selection of projects would be based on a representative test implementation and would provide several years of monitoring before larger scale implementation. All projects would be conducted in the Rincon Valley.